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Report of *Metanephrops* Jenkins, 1972
(Crustacea, Decapoda, Nephropidae) from the upper
Eocene of Grancona (Vicenza, N Italy)

Abstract – We report a specimen of decapod crustacean nephropid, from the upper Eocene of “Fontanella” of Grancona (Vicenza, N Italy). Even though incomplete, the specimen is ascribed to the extant genus *Metanephrops* Jenkins, 1972 (infraorder Astacidea Latreille, 1802, family Nephropidae Dana, 1852), for some morphological characters, such as the strong, elongate, and slender propodus of the left chelae; small sharp teeth on the inner margin of dactylus of left chela; strong conical teeth on the inner margin of index of right chela. At present, this genus is reported in the fossil record only from the Upper Cretaceous (Maastrichtian)-Paleocene of Antarctic Peninsula and in the Pliocene of New Zealand, suggesting the origin of *Metanephrops* in shallow waters in the southern high latitudes. The report of this genus in Italy suggests its wider geographical distribution, including this first occurrence in the northern low latitudes.

Key words: Crustacea, Decapoda, Nephropidae, upper Eocene, N Italy.

Riassunto – Segnalazione di *Metanephrops* Jenkins, 1972 (Crustacea, Decapoda, Nephropidae) nell’Eocene superiore di Grancona (Vicenza, N Italia).

Viene segnalato un esemplare di crostaceo decapode nefropide, rinvenuto nell’Eocene superiore di “Fontanella” di Grancona (Vicenza, N Italia). Anche se incompleto, viene attribuito al genere vivente *Metanephrops* Jenkins, 1972 (infraordine Astacidea Latreille, 1802, famiglia Nephropidae Dana, 1852), per alcuni caratteri morfologici delle chele, quali il forte allungamento del propodus, margine interno del dactylus della chela sinistra con piccoli denti taglienti e margine interno dell’index della chela destra con radi e robusti denti conici. Finora questo genere è segnalato nel record fossile solo nel Cretacico superiore (Maastrichtiano)-Paleocene della Penisola Antartica e nel Pliocene della Nuova Zelanda, suggerendo un’origine di *Metanephrops* in acque poco profonde di alte latitudini meridionali. La segnalazione di questo genere in Italia suggerisce una sua più ampia distribuzione geografica fino alle basse latitudini settentrionali.

Parole chiave: Crustacea, Decapoda, Nephropidae, Eocene superiore, N Italia.

Introduction

The Cenozoic decapod crustaceans of the Berico-Lessinea area have been the subject of many studies for over one century. The recent systematic catalogue of the known species of Vicenza Province by De Angeli & Beschin (2001) provided a check list of one

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hundred and forty- four species of which three were referred to the cirripeds, one to the isopods, one hundred and thirty-eight to the decapods and two to the stomatopods. Recent new discoveries allowed the study of galatheid, chirostylid and porcellanid decapods by De Angeli & Garassino (2002), and the descriptions of ten new species of brachyurans, discovered in “Main” quarry of Arzignano, by Beschin *et al.* (2002).

The macrurans of the Berico-Lessinea area are represented by a small number of species: *Ctenocheles valdellae* (Fabiani, 1908), from the middle-lower Eocene of Nanto, *Neocallichirus fortisi* Beschin, Busulini, De Angeli & Tessier, 2002, and *Eucalliax vicetina* Beschin, Busulini, De Angeli & Tessier, 2002, from the middle Eocene of “Main” quarry of Azignano, *Upogebia perarolensis* De Angeli & Messina, 1992, from the lower Oligocene of Perarolo (Infraorder Thalassinidea Latreille, 1831); *Justitia vicetina* Beschin, De Angeli & Garassino, 2001, from the middle Eocene of “Albanello” quarry of Nogarole Vicentino, *Justitia desmaresti* (Massalongo, 1854) and *Parribacus cristatus* Förster, 1984, from the lower Eocene of Monte Bolca (Infraorder Palinura Latreille, 1802) (Fabiani, 1908; Förster, 1984; De Angeli & Messina, 1992; Beschin *et al.*, 2001, 2002; Garassino & Novati, 2001).

Herein, we report the discovery of two incomplete chelipeds belonging to the extant genus *Metanephrops* Jenkins, 1972, from the Eocene levels of “Fontanella” of Grancona (W Berici Mounts, Vicenza) (Figs. 1, 2, 3).

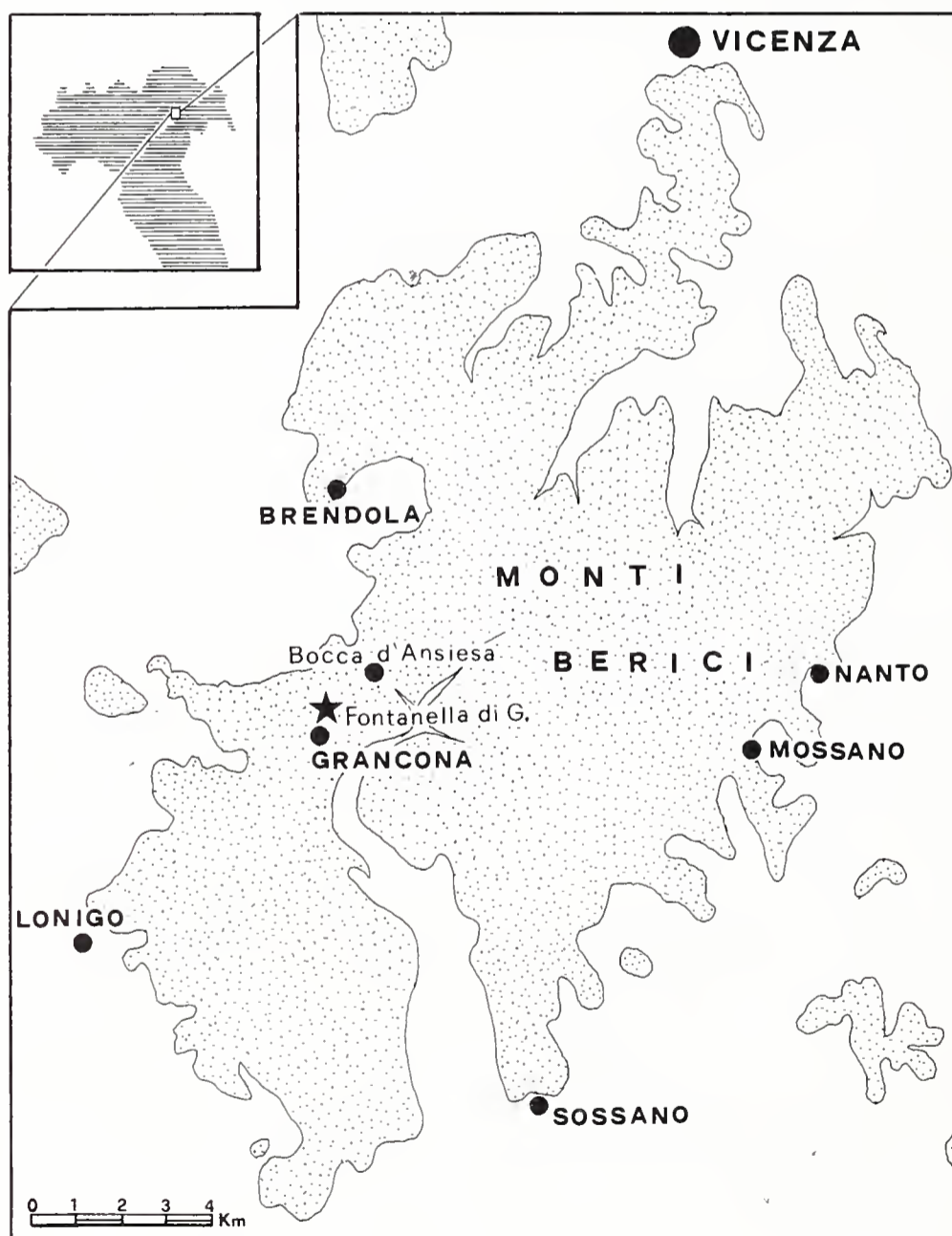


Fig. 1 – Geographical map of Vicenza area. The star shows “Fontanella” of Grancona where the studied specimen where discovered.

Fig. 1 – Mappa geografica dell’area di Vicenza. La stella indica “Fontanella” di Grancona dove l’esemplare studiato è stato rinvenuto.



Fig. 2 – View of the church of Grancona (on the left) and the square close the “Fontanella” of Grancona where the studied specimen was discovered (on the right).

Fig. 2 – Veduta della chiesa di Grancona (sulla sinistra) e del piazzale presso la “Fontanella” di Grancona dove l’esemplare studiato è stato rinvenuto (sulla destra).



Fig. 3 – View of “Fontanella” of Grancona with the marly limestone formation from the middle Priabonian where the studied specimen was discovered.

Fig. 3 – Veduta della “Fontanella” di Grancona con la formazione calcareo marnosa del Priaboniano medio dove l’esemplare studiato è stato rinvenuto.

Geological setting

The stratigraphic sequence of Grancona was defined by Fabiani (1908, 1915) in a palaeontological study of the stratigraphic section of Vagina Mount of Grancona. The author studied the sequence from Zengele quarry (on the right side of Liona Valley, to North of Pederiva) to the top of Vagina Mount. The lower part of this section includes limestone levels and nummulitic marly sandstones intercalated with basaltic materials from the middle Eocene. Over this lower part, there are small breaches, basaltic tuffs and limestone formations, usually muddy and limonitic, including fragments of molluscs and echinoderms (level of *Cerithium diaboli* Brogn.) from the lower Priabonian. A system of layers, 50 metres thick, corresponding to the “layers with *Rotularia spirulaea* (Lamarck)” belongs to the middle Priabonian. Over these layers, yellow or pale-blue marls are alternated with marly limestone layers including nummulites, bryozoans, echinoderms and molluscs, assigned to an upper Priabonian age. The highest part of the section includes calcarenites with calcareous algae, corals and molluscs from the lower Oligocene.

The fossil decapods of this area were discovered in the limestone marly layers from the middle Priabonian of “Fontanella” of Grancona. In this area, previously studied by Fabiani (1910) who described some well preserved specimens of *Palaeograpsus inflatus* Bittner, 1875, a small locality existed some centuries ago from which building material were extracted. Today, this locality has almost completely disappeared.

Recently, thanks to works of excavation, many specimens of decapods have been discovered and are housed in Museo Civico “G. Zannato” di Montecchio Maggiore (Vicenza). The outcrop, a yellow-grey marly limestone litotype easily destroyed by natural agents, belongs to the “layers with *Rotularia spirulaea* (Lamarck)”, including not only many fragments of serpulids and decapods, but also foraminifers, echinoderms, molluscs and crinoids. The studied decapods (De Angeli, 1995) coming from this locality, are: *Callianassa* sp., *Ctenocheles* sp., *Petrochirus* sp., *Lophoranina reussi* (Woodward, 1866), *Dromilites hilarionis* (Bittner, 1883), *Periacanthus horridus* Bittner, 1875, *Montezumella elegans* (Lörenthey & Beurlen, 1929), *Palaeocarpilius macrochelus* (Desmarest, 1822) and *Palaeograpsus inflatus* Bittner, 1875, and the new specimen described below.

Modes of preservation and materials

The nephropid of “Fontanella” of Grancona is preserved in a light-brown, thin layer of yellow grey marly limestone, in relief on the surface. The soft consistency of the surrounding rock made its preparation easy.

The studied specimen is ascribed to *Metanephrops* Jenkins, 1972 (infraorder Astacidea Latreille, 1802, family Nephropidae Dana, 1852) with *M.* sp. since its fragmentary nature did not allow a specific ascription. The specimen is housed in the palaeontological collections of the Museo Civico di Storia Naturale di Milano.

Acronym. MSNM, Museo Civico di Storia Naturale

Systematic Palaeontology

Infraorder Astacidea Latreille, 1802
 Superfamily Nephropoidea Dana, 1852
 Family Nephropidae Dana, 1852
 Genus *Metanephrops* Jenkins, 1972

Type-species: *Nephrops japonicus* Tapparone-Canefri, 1873

Metanephrops sp.
 Figs. 4, 5

Geological age: upper Eocene (Priabonian).

Type locality: "Fontanella" of Grancona (Berici Mounts, Vicenza).

Material and measurements: one incomplete specimen (MSNM i26261) of which only the chelae of pereopods I are preserved (left chela: fragment of carpus, complete propodus, fragment of index and complete dactylus; right chela: fragment of propodus and complete index).

Sizes of left chela: length of propodus (38.6 mm)
 height of propodus (11.1 mm)
 thickness of propodus (5.3 mm)
 length of dactylus (41.1 mm)

Description. Only the left and right chelae are preserved, showing slight heterochely.

Left chela: fragment of carpus, cylindrical in shape, with upper margin having small spiny tubercles. Anterior margin of carpus with a carpus-propodus upper extension. Very elongate propodus, subcylindrical in shape, with upper margin having three strong spiny tubercles and with a weak groove along the entire length of the lower margin. Fragment of index with edentulous inner margin. Narrow and straight dactylus, longer than propodus, with curved distal extremity. Inner margin with small, sharp teeth. Outer surface of all articles strongly rough. Outer margin of index and dactylus with many bristle orifices.

Right chela: fragment of propodus, subcylindrical in shape, with upper margin without spiny tubercles. Inner margin of index with three or four strong conical teeth, located in median and distal parts. Outer surface of propodus and index strongly rough. Outer margin of index with many bristle orifices.

Discussion. Many authors have expressed different views on the taxa that should be included within the Astacidea. A compilation of taxa discussed by Albrecht (1983), Schram *et al.* (1978), Forest & de Saint Laurent (1989), Martin & Davis (2001), Feldmann *et al.*, (2002), Feldmann & de Saint Laurent (2002), Schweigert *et al.* (2003) and Rode & Babcock (2003) suggests that the infraorder Astacidea Latreille, 1802, includes many living and fossil families (there are some doubts about the belonging of Palaeopalaemonidae and Protoastacidae to Astacidea): Astacidae Latreille, 1803 (Lower Cretaceous – Recent), Cambaridae Hobbs, 1942 (Upper Jurassic – Recent), Chilenophoberidae Tshudy & Babcock, 1997 (Upper Cretaceous), Chimaerastacidae Amati, Feldmann & Zonneveld, *in press* (Middle Triassic), Cricoidoscelosidae Taylor, Schram & Shen, 1999 (Upper

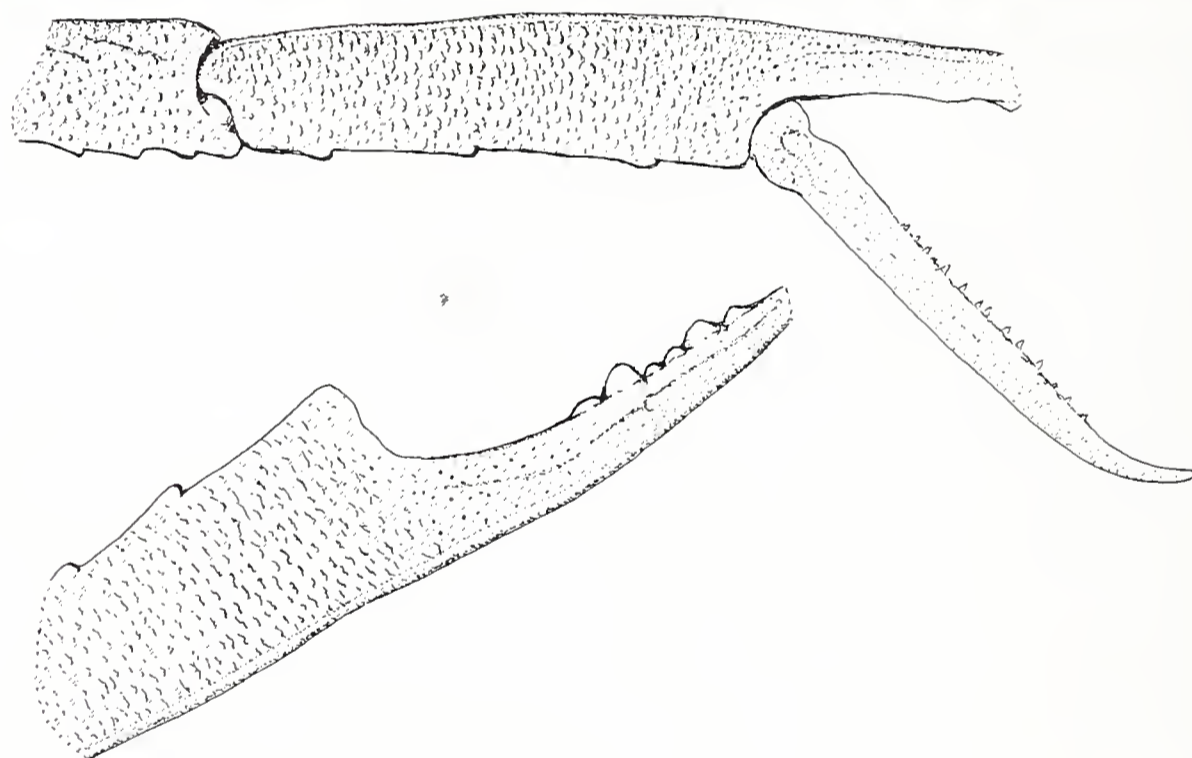


Fig. 4 – *Metanephrops* sp., n. cat. MSNM i26261, photo and reconstruction (natural size).

Fig. 4 – *Metanephrops* sp., n. cat. MSNM i26261, foto e ricostruzione (grandezza naturale).

Jurassic), Erymidae Van Straelen, 1924 (Lower Triassic – Upper Cretaceous), Mecochiridae Van Straelen, 1925 (Upper Triassic – Upper Cretaceous), Nephropidae Dana, 1852 (Middle Triassic – Recent), Palaeopalaemonidae Brooks, 1962 (Upper Devonian), Parastacidae Huxley, 1878 (Oligocene – Recent), Platychelidae Glaessner, 1969 (Upper Triassic), Pemphicidae Van Straelen, 1928 (Middle Triassic), Protoastacidae Alberecht, 1983 (Upper Cretaceous), Uncinidae Beurlen, 1928 (Lower Jurassic) and Glypheidae Zittel, 1885 (Upper Triassic – Recent).

Among these families only the representatives of the family Nephropidae show slender and very elongate propodus of chelae, like those of the studied specimen. Today, this family may include as many as twelve living and fossil genera, based upon a compilation of taxa mentioned by Jenkins (1972), Aguirre Urreta *et al.* (1991), Feldmann (1989), Hu (1983), Tshudy & Sorhannus (2000): *Jagtia* Tshudy & Sorhannus, 2000 (Upper Cretaceous), *Homarus* Weber, 1795 (Upper Cretaceous – Recent), *Hoploparia* M'Coy, 1849 (Lower Cretaceous – Miocene), *Lissocardia* Meyer, 1847 (Middle Triassic), *Metanephrops* Jenkins, 1972 (Upper Cretaceous – Recent), *Nephrops* Leach, 1814 (Paleocene), *Nephropsis* Wood-Mason, 1872 (Paleocene), *Oncopareia* Bosquet, 1854 (Upper Cretaceous), *Palaeohomarus* Mertin, 1941 (Lower-Upper Cretaceous), *Palaeonephrops* Mertin, 1941 (Upper Cretaceous), *Paraclytia* Fritsch, 1877 (Upper Cretaceous) and *Wongastacia* Hu, 1983 (upper Miocene). Even though the studied specimen is incomplete, the slender and very elongate propodus of pereopod I with the inner margin of the dactylus of the left chela with small, sharp teeth and the inner margin of the index of the right chela with some strong, conical teeth are typical of *Metanephrops*, as observed in some living species (Holthuis, 1991), such as *M. australiensis* (Bruce, 1966), *M. sibogae* (De Man, 1916), and *M. velutinus* Chan & Yu, 1991. Moreover, the slight hetherochely of pereopod I with the right chela stronger than left chela, is typical of this genus (Holthuis, 1991), as observed not only in the studied specimen, but also in some living species, such as *M. andamanicus* (Wood-Mason, 1891), *M. armatus* Chan & Yu, 1991, *M. japonicus* (Tapparone-Canefri, 1873), *M. sinensis* (Bruce, 1966), and *M. velutinus* Chan & Yu, 1991. In fact, the other above mentioned fossil genera show in some cases strong hetherochely, such as in *Homarus* and *Palaeohomarus*, or inner margins of the dactylus and index that are strongly dentate with sharp or conical teeth, such as *Lissocardia*, *Nephrops*, *Nephropsis*, *Hoploparia*, *Palaeonephrops* and *Oncopareia* (*Wongastacia* is not included in this list because it does not preserve the chelae of pereopod I).

As reported by Feldmann (1989), *Metanephrops* was erected by Jenkins (1972) to include one fossil species, *M. motunauensis*, from the Pliocene of New Zealand, and all living species of *Nephrops*, except the type species, *N. norvegicus*. In the fossil record, the two oldest species of this genus were discovered in the James Ross Basin (Antarctic Peninsula) in the Upper Cretaceous layers, *M. rossensis* Feldmann *et al.*, 1993 (Campanian) and *M. jenkinsi* Feldmann, 1989 (Maastrichtian-Paleocene) (Feldmann, 1989; Feldmann *et al.*, 1993). The discovery of these two species suggests that the genus originated in the southern high latitudes. As reported by Feldmann (1989), the three fossil species were probably inhabitants of the continental shelf whereas modern forms are rare in shelf depths and common at slope depths. *Metanephrops* originated in shallow waters in the southern high latitudes and then radiated into lower latitude, deepwater habitats.

Extant *Metanephrops* has a wide latitudinal distribution, ranging from the Western Atlantic region (from Bahamas Islands and S Florida to French Guiana, including Gulf of Mexico, Caribbean Sea and Argentina) to the Indo-West Pacific region (E Africa, Madagascar, Andaman Sea, S China Sea, Taiwan, Indonesia, Japan, Korea, Australia and New Zealand), so the ascription of the Italian specimen to this genus suggests a wider distribution for the fossil representatives including the northern low latitudes. At the same time it points out the close relationships between the rich and diversified Eocene faunas of Veneto and those of the warm seas of the Indo-Pacific area.

Unfortunately, the fragmentary nature of the study specimen did not allow comparison with the other fossil species of the genus. Only the discovery of more complete specimens will make possible in the future a more detailed morphological description of this probable new species, limited at present to a sample report.



Fig. 5 – Geographical distribution of the representatives of *Metanephrops* Jenkins, 1972, living (dotted) and fossil (1: *M. rossensis* Feldmann *et al.*, 1993, Campanian, Antarctic Peninsula; 2: *M. jenkinsi* Feldmann, 1989, Maastrichtian-Paleocene, Antarctic Peninsula; 3: *M. motunauensis* Jenkins, 1972, Pliocene, New Zealand; 4: *M. sp.*, upper Eocene, N Italy).

Fig. 5 – Distribuzione geografica dei rappresentanti di *Metanephrops* Jenkins, 1972, viventi (punteggiato) e fossili (1: *M. rossensis* Feldmann *et al.*, 1993, Campaniano, Penisola Antartica; 2: *M. jenkinsi* Feldmann, 1989, Maastrichtiano-Paleocene, Penisola Antartica; 3: *M. motunauensis* Jenkins, 1972, Pliocene, Nuova Zelanda; 4: *M. sp.*, Eocene superiore, N Italia).

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References

- Aguirre Urreta M.B., Olivero E.B. & Medina F.A., 1991 – A redescription of a Maastrichtian lobster *Hoploparia antarctica* Wilckens, 1907 (Crustacea: Decapoda), from Chubut, Argentina. *Journal of Paleontology*, Lawrence, 65(5): 795-800.

- Albrecht H., 1983 – Die protoastacidae n.fam., fossile Vorfahren der Flußkrebse? *Neues Jahrbuch für Geologie, Paläontologie und Mineralogie*, Stuttgart, 1983(1): 5-15.
- Beschin C., De Angeli A. & Garassino A., 2001 – *Justitia vicetina* sp. nov. (Crustacea, Decapoda) dell'Eocene di Chiampo (Vicenza, Italia settentrionale). *Studi Trentini Scienze Naturali – Acta Geologica*, Trento, 76 (1999): 89-97.
- Beschin C., Busulini A., De Angeli A. & Tessier G., 2002 – Aggiornamento ai crostacei eocenici di cava “Main“ di Arzignano (Vicenza – Italia settentrionale) (Crustacea, Decapoda). *Studi e Ricerche, Associazione Amici Museo – Museo Civico “G. Zannato”*, Montecchio Maggiore (Vicenza), 2002: 7-28.
- De Angeli A., 1995 – Crostacei dell'Eocene superiore di “Fontanella” di Grancona (Vicenza – Italia settentrionale). *Studi e Ricerche, Associazione Amici Museo – Museo Civico “G. Zannato”*, Montecchio Maggiore (Vicenza), 1995: 7-24.
- De Angeli A. & Messina V., 1992 – *Upogebia perarolensis* nuova specie di crostaceo del Terziario del Veneto (Italia). *Società Veneziana Scienze Naturali*, Venezia, 17: 183-191.
- De Angeli A. & Beschin C., 2001 – I Crostacei fossili del territorio Vicentino. *Natura Vicentina*, Vicenza, 5: 5-54.
- De Angeli A. & Garassino A., 2002 – Galatheid, chirostylid and porcellanid decapods (Crustacea, Decapoda, Anomura) from the Eocene and Oligocene of Vicenza (N Italy). *Memorie Società italiana Scienze naturali e Museo civico Storia naturale Milano*, Milano, 30 (3): 1-40.
- Fabiani R., 1908 – Paleontologia dei Colli Berici. *Memorie Società Italiana Scienze dei Lincei*, Roma, 3 (15): 45-248.
- Fabiani R., 1910 – I Crostacei terziari del Vicentino. *Bollettino Museo Civico Vicenza*, Vicenza, 1: 1-40.
- Fabiani R., 1915 – Il Paleogene del veneto. *Memorie Istituto Geologico Università Padova*, Padova, 3: 5-336.
- Feldamm R.M., 1989 – *Metanephrops jenkinsi* n.sp. (Decapoda: Nephropidae) from the Cretaceous and Paleocene of Seymour Island, Antarctica. *Journal of Paleontology*, Lawrence, 63(1): 64-69.
- Feldmann R. M., Tshudy D. M. & Thomson M. R. A., 1993 – Late Cretaceous and Paleocene Decapod Crustaceans from James Ross Basin, Antarctic Peninsula. *Journal of Paleontology*, Lawrence, Memoir 28: 1-41.
- Feldmann R. M., Crisp G. & Pirrie D., 2002 – A new species of glypheoid lobster, *Pseudoglyphea foersteri* (Decapoda: Astacidea: Mecochiridae) from the Lower Jurassic (Pliensbachian) of Raasay, Inner Hebrides, UK. *Palaeontology*, London, 45(1): 23-32.
- Feldmann R. M. & Saint Laurent M. de, 2002 – *Glyphea foresti* n. sp. (Decapoda) from the Cenomanian of Northern Territory, Australia. *Crustaceana*, Leiden, 75(3-4): 359-373.
- Forest J. & Saint Laurent M. de, 1989 – Nouvelle contribution à la connaissance de *Neoglyphea inopinata* Forest & de Saint Laurent, à propos de la description de la femelle adulte. *Résultats des Campagnes Musorstom*, Paris, 5 : 75-92.
- Förster R., 1984 – Bärenkrebse (Crustacea, Decapoda) aus dem Eozän Italiens. *Mitteilungen Bayerischen Staatssammlung Paläontologie Historische Geologie*, München, 24: 57-66.

- Garassino A. & Novati M., 2001 – *Justitia desmaresti* (Massalongo, 1854) (Crustacea, Decapoda) from the Lutetian (Middle Eocene) of Monte Bolca (Verona, N Italy). *Atti Società italiana Scienze naturali e Museo civico Storia naturale Milano*, Milano, 141 (2): 251-268.
- Holthuis L. B., 1991 – FAO Species Catalogue. 13. Marine Lobsters of the World. Rome.
- Hu C.-H., 1983 – Discovery Fossil Lobster From the Kueichulin Formation (Miocene), Southern Taiwan. *Annual Report*, Taipei, 26: 129-136.
- Jenkins R.J.F., 1972 – *Metanephrops*, a new genus of Late Pliocene to Recent lobsters (Decapoda, Nephropidae). *Crustaceana*, Leiden, 22(2): 161-177.
- Martin J. W. & Davis G. E., 2001 – An Updated Classification of the Recent Crustacea. *Natural History Museum of Los Angeles County*, Los Angeles, 39: 1-123.
- Rode A.L. & Babcock L.E., 2003 – Phylogeny of fossil and extant freshwater crayfish and some closely related nephropid lobsters. *Journal of Crustacean Biology*, 23(2): 418-435.
- Schram F.R., Feldmann R.M. & Copeland M.J., 1978 – The Late Devonian Palaeopalaemonidae and the earliest decapod crustaceans. *Journal of Paleontology*, Lawrence, 52(6): 1375-1387.
- Schweigert G., Garassino A., Hall R. L., Hauff R. B. & Karasawa H., 2003 – The lobster genus *Uncina* Quenstedt, 1851 (Crustacea: Decapoda: Astacidea: Uncinidae) from the Lower Jurassic. *Stuttgarter Beiträge zur Naturkunde*, Stuttgart, ser. B, 332: 1-43.
- Tshudy D.M. & Sorhannus U., 2000 – *Jagtia kunradensis*, a new genus and species of clawed lobster (Decapoda: Nephropidae) from the Upper Cretaceous (Upper Maastrichtian) Maastricht Formation, The Netherlands. *Journal of Paleontology*, Lawrence, 74(2): 224-229.

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